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EFFECTS OF WEANING AGE ON GROWTH, HEALTH AND MORTALITY OF PIGLETS IN GOVERNMENT PIG FARM

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ABSTRACT: A study was conducted with the objective to evaluate the effects of weaning age on growth, health and mortality of piglets in a government farm. Forty-two piglets belonging to breed Duroc, Saddleback and Large Black, were selected randomly from piglets of five sows and were assigned to three treatments. The treatments were; T1 (28 days weaning age), T2 (35 days weaning age) and T3 (42 days weaning age). Each treatment was allotted 14 piglets. Piglets were weighed on day zero, weekly and on the day of weaning till 60 days. Daily post weaning feed consumption for each group was recorded. Incidences of diseases and mortality in all groups were recorded in pre-weaning (0 to 28 days) and post-weaning (28 to 60 days) periods. The mean final weight gain at 60 days was highest in T3, followed by T2 and T1. However, there was no significant difference among treatments in weight gain. Also, the survival in pre-weaning was similar in all treatments. Post-weaning survival was highest in T3 and lowest in T1, although there was no significant difference in survival among groups. The findings suggest that piglets can be weaned at an earlier age than the currently followed age (48 days) in the government farm, provided there is proper management and improved facilities in farrowing and nursery sheds.

Keywords: Age; body weight; mortality; piglet; survival; weaning.

1. INTRODUCTION

Pigs play an important role in sustaining livelihoods of rural poor and pigs are seen as an entry point for poverty alleviation (Biryomumaisho and Ogala 2007). Fulfilling piglet demands of farmers has always been a challenge for the government farms. In 2013, the piglets demand from 18 districts was 9,000 and the government farms could supply only 4,500 piglets (Dema 2016). The demand for pork is met through import from neighboring countries like India and Nepal (DoL 2007). According to MoAF (2015), the import of pork in 2014 was 2165 Metric Tons (MT) against domestic pork production of only 462.46 MT. One of the contributing factors to these existing issues could be due to large weaning ages in the government pig farms. Thapa (2011) reported 48.78 days as weaning age in NPiRDC, Gelephu and 46.77 days in RPBC, Lingmethang. Sow loses more than 15% of body weight during long lactation and results in longer unproductive days (Quensel et al. 2008). Late lactation decreases the number of piglets produced per year as sows do not come into heat

when it has a nursing litter while early weaning age increases piglets per sow per year. However, the reported disadvantages of early weaning are reduced growth rate, poor health and high mortality in piglets. These information shows that there is a need to identify an appropriate weaning age under conditions found in government pig farms. Therefore, a study was conducted with the primary objective to compare body weight gain and survival of piglets under three early weaning ages till 60 days of age.

2. MATERIALS AND METHOD

2.1 Study area, treatments and sample size

The study was carried out at a pig farm of NPiRDC, Gelephu, Sarpang district. The study was carried out from December 2016 to February 2017. Mixed breed of Duroc, Saddleback and Large Black were used. There were three weaning treatments. The first treatment (T1) was 28 days weaning age, second treatment 35 days weaning age and the third treatment 42 days weaning age. Piglets were selected randomly with draw-lot method and assigned to three treatment groups. Each treatment group had 14 piglets. The sample size of 14 piglets was determined sing the formula: $n = 1 + 2c\left(\frac{S}{d}\right)^2$ (Shah 2011).

2.2 Animal management

Piglets were weighed individually using digital weighing balance and their ears were notched for identification on the day of farrowing. Piglets were weaned at 28, 35 and 42 days old and transferred to weaner shed. Each treatment group was maintained in a pen measuring 3.14 m × 3.28 m. The pen had complete solid concrete floors equipped with feeding and drinking troughs.

Weaner pigs were fed starter feed mixed with effective microorganism (EM) solution. Feed and water were provided *ad libitum* throughout the experimental period. In-house temperatures were recorded in the morning, afternoon and evening.

2.3 Data collection

Individual piglets were weighed using a digital weighing balance before feeding. Piglets in all groups were weighed on the day of weaning and weekly thereafter until piglets were 60 days of age. Feed consumption was recorded daily after weaning i.e. from 28 days, 35 days and 42 days old until 60 days old. Feed was weighed on daily basis before feeding, using a digital weighing balance. Leftover feed was collected and weighed daily and recorded. The incidences of mortality were recorded before weaning from 0 to 28 days and after weaning from 28 to 60 days in all three groups.

2.4 Data analysis

Average Daily Feed Intake (ADFI) and Average Daily Gain (ADG) were calculated in Microsoft Excel. Average Daily Feed Intake (ADFI) was calculated by dividing total feed consumed post weaning (for each weaning age) by the numbers of pigs fed daily. Average Daily Gain (ADG) was calculated by dividing body weight gain (Final weight gain - initial weight) by feeding days. To compare means of final weight gain and to determine the effect of weaning, the analysis of covariance (ANCOVA) was conducted. Piglet survival were analyzed using Kaplan-Meier survival model. Event in this study was the death or diseases occurred during the study period. Survival time was expressed in days. The pre-weaning survival was from 0 to 28 days and the post weaning survival was after 28 to 60 days.

3. RESULTS AND DISCUSSION

3.1 Growth of piglets

The average body weights of piglets in three groups were compared from 0 to 60 days of age (Figure 1). All piglets in three treatments had similar average initial weights at the time of farrowing; 1.66 kg, 1.67 kg and 1.59 kg for T1, T2 and T3, respectively. The average weights of piglets in all treatments were also similar until four weeks of age; 5.75 kg, 5.70 kg, 5.61 kg for T1, T2 and T3, respectively. However, in T3, the body weight of piglets increased after four weeks till six weeks of age (5.65 kg to 8.52 kg). After six weeks (age at weaning), the weight increased slightly till seven weeks of age. In T1, the weight gained by piglets was lower than T2 and T3 after four weeks (age at weaning).

After seven weeks, piglets in all treatments showed increase in body weight. However, the final weight gain at nine weeks (60 days) was slightly higher in T3, although the difference was not significant among groups. Gonzalez et al. (2015) and Cabrera et al. (2014) reported that late weaning gives better results than early weaning and the final weight gains for late weaning are significantly greater than the early weaning. The average daily weight gain of piglets was found better under long nursing period (Gonzalez et al. 2015; Cabrera et al. 2014). This could be due to minimal weaning stress experienced by the bigger and older pigs at weaning. Meulen et al. (2010) compared the stress hormonal level between late weaning at 7 weeks and early weaning at 4 weeks in Landrace and Large White pigs. The authors found that the level of stress hormone cortisol was higher in piglets weaned at 4 weeks than those weaned at 7 weeks.

3.2 Effect of initial weight and weaning age on growth rate of piglets

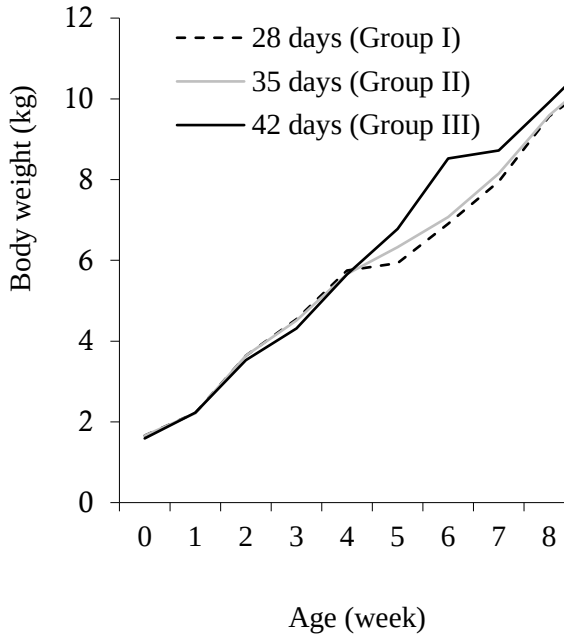

Figure 1: Weekly body weight of piglets weaned at different age.

Table 1 presents the initial and final weights of piglets in three treatment groups. The mean initial body weights of piglets were 1.65±0.29 kg, 1.67±0.14 kg and 1.58±0.33 kg for group one, two and three, respectively. The mean final body weight at 60 days was 10.55±1.37 kg, 10.94±1.40 kg and 11.13±2.36 kg for T1, T2 and T3, respectively. However, the nonsignificant difference among treatments suggests that weaning age has no significant effect on final weight gain. This could be explained by reduced weaning stress due to good facilities such as brooder for piglets, tarpaulin to protect from cold wind, dry grass, concentrate feed and good welfare in the farm. Montsho et al. (2016) and Liliveld et al. (2013) reported that weaning has no effect on performance of piglets. However, in their studies, the weaning ages were 21, 28 and 35 days in Large White and Landrace cross in Ireland and Botswana.

The mean final body weight was highest in T3 (11.13±2.36 kg), followed by T2 (10.94±1.40 kg) and T1 (10.55±1.37 kg). Similar findings were reported for Large White Yorkshire pigs weaned at 28, 42 and 56 days, where piglets weaned at older age were heavier than those weaned at younger age (Jayashree and Sivakumar 2013; Vega et al. 2012; Wolter and Ellis 2001). This could be due to body weight gain at weaning. The lower body weight at weaning could be due to environmental stress (cold stress) as nursery shed in NPiRDC lacks brooding facilities and the in-house temperature ranges from 17˚C to 27˚C in December. The 14 to 28 days old piglets require temperature range from 22˚C to 23˚C (Yan and Yamamoto 2000), which likely explains the low body weight at weaning and may have affected the final weight gain.

Table 1: Post-weaning ADG and ADFI under different treatments

Parameters	Weaning age		
	28 days	35 days	42 days
ADG (kg)	0.14	0.15	0.16
ADFI (kg)	0.27	0.38	0.43

3.3 Feed intake and weight gain

The piglets in T3 had higher Average Daily Gain (ADG) of 0.16 kg and piglets in T1 had lower ADG of 0.14 kg (Table 2). Similarly, the piglets in T3 had higher Average Daily Feed Intake (ADFI) compared to piglets in T1. This could be due to lower body weight at 28 days weaning age and lower body weight at 60 days, compared to 35 and 42 days weaning age. Our finding agrees with that of Colson et al. (2005) and Wolter and Ellis (2001) who reported decrease in ADG of piglets weaned at 21 and 28 days.

In this study, though there was no reduction in body weight in T1 from the day of weaning (Figure 2), the ADG was lower compared to T2 and T3. This could be because of low body weight at weaning, therefore, ADFI of T1 was also lower than T2 and T3. Montsho et al. (2001) compared the late weaning at 35 days age with the early weaning at 21 days age and found that piglets weaned at 21 days of age consumed more feed than those weaned at 35 days of age. This is because the early weaned piglets are more adapted to solid feed than late weaned piglets (Montsho et al. 2001). Whereas, in this study, the piglets when kept with sow did not consume much of solid feed. There are two possible reasons. Firstly, the sows provided enough milk that piglets did not consume solid feed. Secondly, the low temperature in nursery shed may have discouraged piglets from visiting the feeding tough.

Table 2: Initial and final body weight of piglets under different treatments. Figures inside cells represent means±se. Means with similar letters are not significantly different.

	Weaning age		
Parameter	28 days	35 days	42 days
Initial weight (kg)	1.65±0.3a	1.67±0.1a	1.58±0.3a
Weight at 60 days (kg)	10.55±1.4a	10.94±1.4a	11.13±2.4a

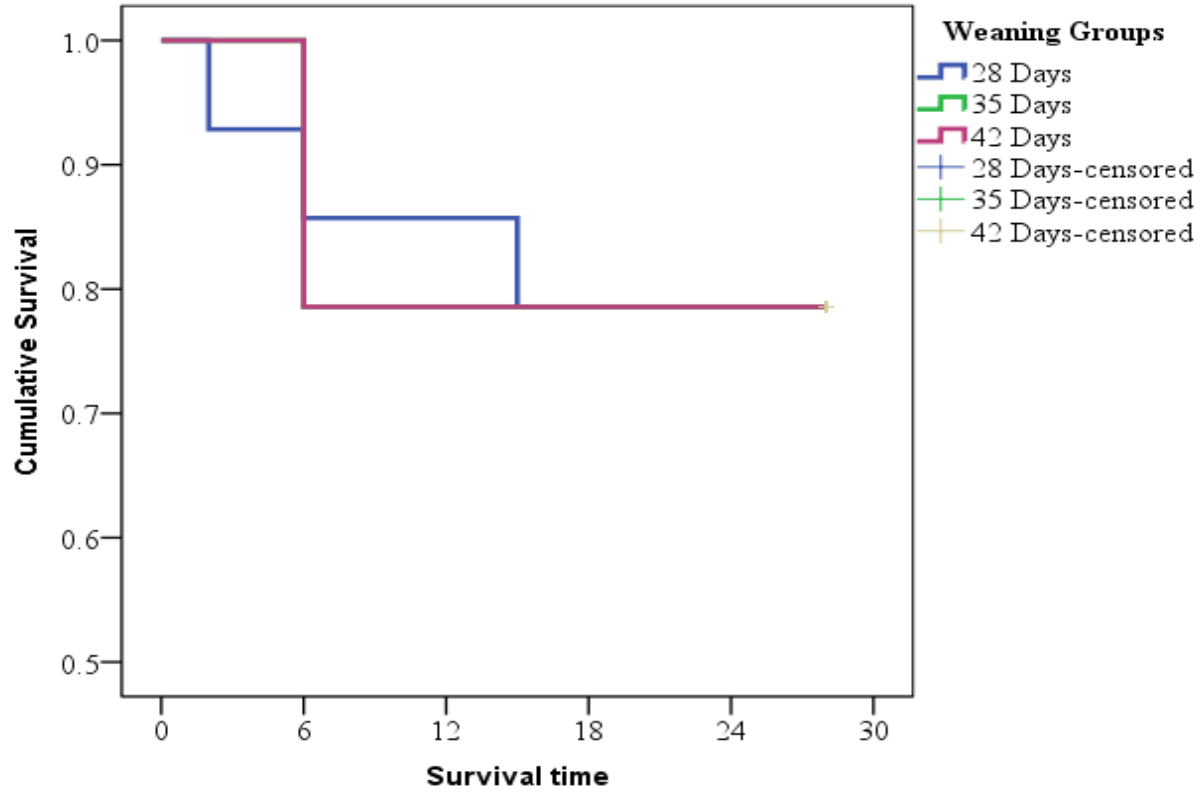

Figure 2: Survival of pre-weaning in three weaning groups.

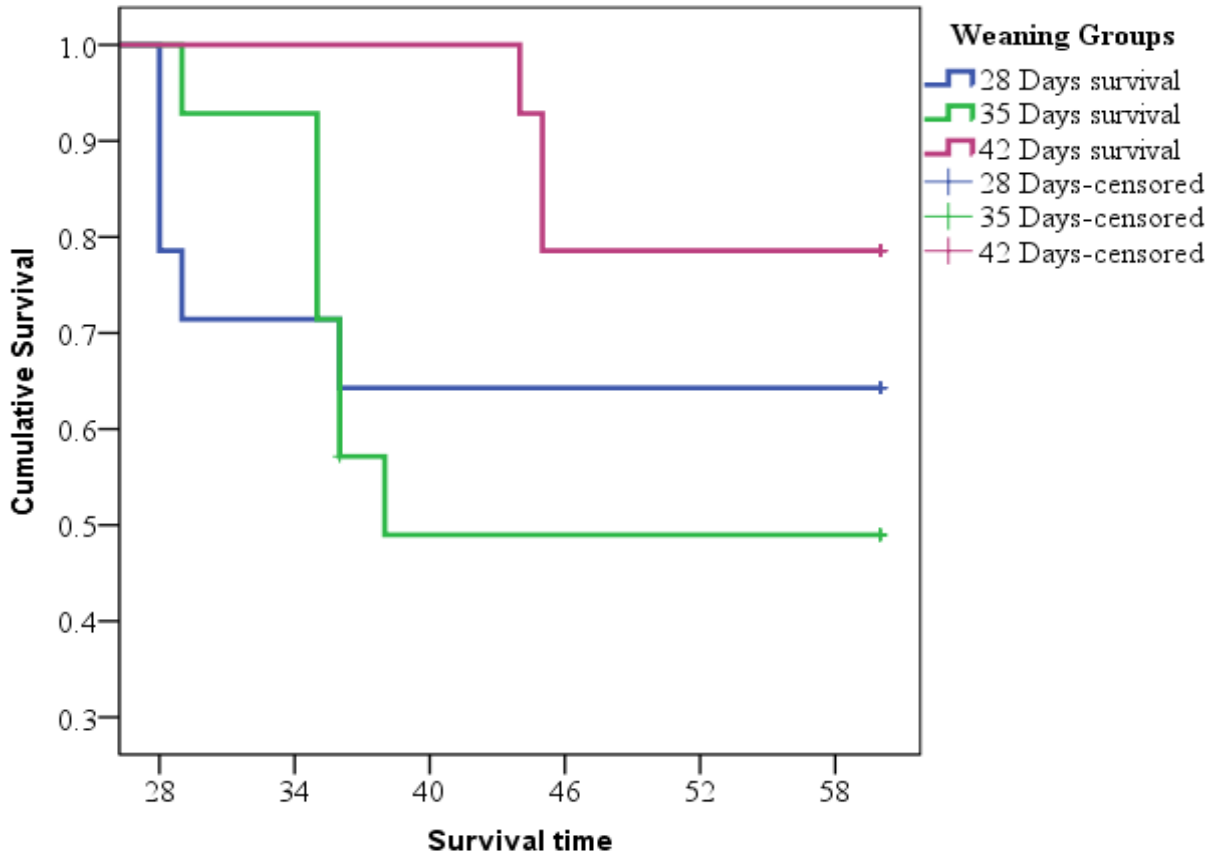

Figure 3: Survival curve of post-weaning in three groups

3.4 Pre-weaning mortality

None of the piglets died during the experimental period. The mean survival time at pre-weaning was similar across all three treatments but the mean survival time at post-weaning was highest in T3 and lowest in T1 (Table 3). However, there was no significant difference among three treatments. The similar pre-weaning survival time in three groups could be because there was equal number of piglets suffering from diarrhoea due to algalactic sow. The piglets in all treatments were from same sow that suffered from algalactia and diarrhoea. The incidences of an event in pre-weaning from 0 to 28 days were mostly around 6 days, however, there was no pre-weaning mortality (Figure 3). The incidences of diarrhoea in NPiRDC, Gelephu within first week of age were also reported by Sherab (2012).

Table 3: Mean (±se) survival time of pre-weaning and post-weaning of piglets. Means within the row with same letters do not differ significantly.

	Mean survival time (days)		
Weaning	28 days	35 days	42 days
Pre-weaning	23.6±2 a	23.3±2 a	23.4±2 a
Post-weaning	47.2±4 a	49.2±3 a	56.7±2 a

3.5 Post-weaning mortality

The post-weaning mortality of piglets is presented in Figure 4. The incidences of diseases occurred mostly around 28, 35 and 44 days. The event in T1 and T2 occurred immediately after weaning, while it occurred later in T3. This could be because the younger and smaller piglets exhibited more stress than older and bigger piglets at weaning. Piglets weaned at young age are reported to have high level of cortisol, indicating high stress (Meulen et al. 2010; Worobec et al. 1999; Dividich and Herpin 1994).

The symptoms of diseased piglets were off feed, diarrhoea and swollen limbs, which occurred mostly in T1, followed by T2 and T3. The stress arises mainly from maternal separation, mixing with unfamiliar littermates, change in environment (nursery to weaner shed) and change in diet (sow milk). Weaning stress compromises intestinal barrier function (Bruininx et al. 2001; McCracken et al. 1999). Masri et al. (2014) evaluated the small intestine of Landrace, Large White and their hybrids and reported that weaning at 28 days caused dramatic structural changes in the mucosa than weaning at 35 days and later. This results in diarrhoea and poor performance of newly weaned piglets (Pluske 2016; Campbell et al. 2013). The low feed intake in the immediate post weaning period contributes to morphological changes in intestine, exposing it to pathogens causing diarrhoea (Dong and Pluske 2007; Spreeuwenberg et al. 2004).

Due to mixing of unfamiliar littermates, the piglet fighting was observed more in T1 and T2. Piglets mixed at earlier age were reported to show aggression and fighting as pigs seek dominance hierarchies (Colson et al. 2005; Boe 1991). This could have affected the limbs of the piglets, resulting in swollen limbs.

However, piglets in all treatments revived within a week and survived till 60 days and there was no post-weaning mortality. This could be due to improved brooding facilities such as electric heater, dry grass bedding, tarpaulin curtains to protect from cold wind, which maintain optimum temperature required by the piglets. High post-weaning survival in government piggery farms has been reported (Sherab 2012; Thapa 2011).

4. CONCLUSION

Examining the weight gained at 60 days and with 100% post weaning survival, piglets can be weaned at an earlier age than the current practice of weaning at 48 days. However, the low weight of piglets weaned at 28 days suggests that weaning at a very early age is not advisable. Proper farm management practices and improvement of facilities in the farrowing and nursery sheds are important to improve the body weight at weaning. Further, the maintenance of mating at 0% inbreeding level would have low impact on growth and may improve pig performance.

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REFERENCES

Biryomumaisho S Ogala R (2007). A study of pre-weaning piglet moratality in selected farms in the peri-urban areas of Kampala, Uganda. Africa Journal of Animal and Biomedical Science, 2 (1): 1-9.

Bruininx EMAM, VanDerPeetSchwering CMC, Schrama JW, Vereijken PFG, Vesseur PC, Everts H, Hartog LA and Beynen AC (2001). Individually measured feed intake characteristics and growth performance of

group- housed weanling pigs: Effect of sex, initial body weight and body weight distribution within groups. Journal Animal Science, 79: 301-308.

Boe K (1991). The process of weaning in pigs : When the sow decides. Applied Animal Behavior Science, 30: 47–59.

Cabrera RA, Boyd RD, Jungst SB, Wilson ER, Johnston ME, Vignes, JL and Odle J (2014). Impact of lactation length and piglet weaning weight on long-term growth and viability of progeny. Journal of Animal Science, 88: 2265-2276. doi:10.2527/jas.2009-2121.

Campbell JM, Crenshaw JD and Polo J (2013). The biological stress of early weaned piglets, Journal of Animal Science and Biotechnology, 4(19): 2-4.

Colson V, Orgeur P, Foury A and Mormede P (2005). Consequences of weaning piglets at 21 days and 28 days on growth, behaviour and hormonal responses. Journal of Applied Animal Behaviour Science, 98: 70–88. doi: 10.1016/j.applanim.2005.08.014.

Dema K (2016). Thai pigs to replace existing breed. Available at: <http://www.Kuenelonline.com> (Accessed on 30 November, 2016).

Department of Livestock [DoL] (2007). Livestock population and production bulletin: Data pertaining to year 2005 and earlier periods. Thimphu: MoA.

Dividich LJ and Herpin P (1994). Effects of climatic conditions on the performance, metabolism and health status of weaned piglets: A review. Journal of Livestock Production Science, 38: 79-90.

Dong GZ and Pluske JR (2007). The low feed intake in newly-weaned pigs: Problems and possible solutions. Asian-Australian Journal Animal Science, 20 (3): 440-452. http://doi:org.searse.sci-hub.cc/10.5713/ajas.2007.440.

Gonzalez F, Robledo J, Andrada JA, Vargas JD and Aparicio MA (2015). Production levels and health status in Iberian piglets at weaning. Journal Animal Science, 90: 5035-5039. doi: 10.2527/jas2011-4921.

Jayashree PC and Sivakumar T (2013). Influence of early weaning on productive and reproductive performance in largwhite yorkshire pigs. Tamil Nadu Journal Veterinary and Animal Science, 9 (3): 207-212.

Liliveld LMC, Riemensperger AV, Gardiner GE, Doherty OJV, Lynch PB and Lawlor PG (2013). Effect of weaning age and post weaning feeding programme on the growth performance of pig to 10 weeks of age. Livestock Science, 157: 225-233. http://dx.doi.org/10.1016/j.livsci.2013.06.030.

Masri SA, Hunigen H, Aiyan AA, Rieger J, Zentek J, Richardson K and Plendl J (2014). Influence of age at weaning and feeding regimes on the postnatal morphology of the porcine small intestine. Journal of Swine Health and Production, 23 (4): 186-203.

McCracken BA, Spurlock ME, Roos MA, Zuckermann FA and Gaskins HR (1999). Weaning anorexia may contribute to local inflammation in the piglet small intestine, Journal of Nutrition, 129: 613–619.

Meulen JVD, Koopmans SJ, Dekker RA and Hoogendoorn A (2010). Increasing weaning age of piglets from 4 to 7 weeks reduces stress, increases post-weaning feed intake but does not improve intestinal functionality. Animal, 4 (10): 1653-1661. doi:10.1017/S1751731110001011.

Montsho TM, Moreki JC, Tsopito CM and Nsoso SJ (2016). Effect of weaning age on growth performance of cross breed pigs reared upto 70 kg body weight under intensive system. Journal of Animal Science and Veterinary Medicine, 1: 87-94.

Njoku CP, Aina ABJ, Sogunle OM, Idowu OMO and Osofowora A (2012). Effect of feeding duration on performance and carcass characteristics of growing pigs. Online Journal of Animal Feed and Research, 2 (5): 445-449.

Onyimonyi AE, Ugwu SOC and Machebe NS (2010). Performance and linear measurements of growing pigs fed on basis of their body weight. Pakistan Journal of Nutrition, 9 (1): 57-59. doi:10.3923/pjn.2010.57.59.

Penjor (2008). The marriage system in lower Kheng. Bhutan: Ways of knowing. London, IAP.

Pluske JR (2016). A review: Aspects of gastrointestinal tract growth and maturation in the pre-and postweaning period of pigs. Journal Animal Science, 94: 394-411. doi: 10.2527/jas2015-9767.Quesnel H, Brossard L, Valancogne A and Quiniou N (2008). Influence of some sow characteristics on within-litter variation of piglet birth weight. Journal of Animal, 2 (12): 1842-1849. doi: 10.1017/S175173110800308X.Schinckel AP, Pas J, Ferrell J, Einstein ME, Pearce SM and Boyd RD (2004). Analysis of pig growth from birth to sixty days of age. The Professional Animal Scientist, 20: 79-86.

Shah H (2011). Sample size in animal studies. National Journal of Physiological Pharmacy and Pharmacology, 1: 35-39.

Sherab P (2012). Effects of feeding red soil to piglets for prevention of piglets anemia in the confined

pig rearing system. College of Natural Resources, Lobesa, Punakha.

Spreeuwenberg VMAM, Verdonk JMAJ, Bakker GCM, Beynen AC and Verrstegen MWA (2004). Effect of dietary protein source on feed intake and small intestinal morphology in newly weaned piglets. Livestock Production Science, 86: 169–177. doi:10.1016/S0301-6226(03)00166-0.

Thapa L (2011). Assessment of performance of the Government farms in Bhutan. College of Natural Resources, Lobesa, Punakha.

Vega RS, Estrella AS, Valera AM, Cluad AT and Villar EC (2012). Performance of selected Philippine commercial piggery farms weaning at different ages. Phillipine Journal of Veterinary Animal Science, 38 (2): 127-13.

Wangchuk R (2005). An integral part of Bongop culture. Available at: <http://www.Kuenelonline.com>(Accessed on 30 September, 2016).

Wolter BF and Ellis M (2001). The effect of weaning weight and rate of growth immediately after weaning on subsequent pig growth performance and carcass characteristics. Canadian Journal of Animal Science, 103 (29): 157-226.

Worobec EK, Duncan IJH and Widowski TM (1999). The effects of weaning at 7, 14, and 28 days on piglet behavior. Applied Animal Behaviour Science, 62: 173-182.

Yan PS and Yamamoto S (2000). Relationship between thermoregulatory responses and heat loss in piglets. Journal of Animal Science, 71: 505–509.